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Directorate of
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China: Limitations on Technology Absorption [redacted]

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An Intelligence Assessment

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EA 83-10247
December 1983

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China: Limitations on Technology Absorption

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An Intelligence Assessment

This paper was prepared by Office of East Asian Analysis, with contributions from Office of Imagery Analysis. Comments and queries are welcome and may be directed to the Chief, Development Issues Branch, OEA.

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China: Limitations on Technology Absorption

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Key Judgments

Information available as of 14 December 1983 was used in this report.

China has embarked on a program to improve its capability to absorb—that is, to understand and integrate into the economy—advanced technologies. China's close participation with Western firms should contribute to the development of an absorptive capability superior to that of those less developed countries that invite Western companies to build industries but do not take an active role in the planning and operation of projects.

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China's achievements over the next 15 to 20 years will not, however, meet Beijing's expectations. Chinese industries will progress technologically and provide China with a greater variety of products for domestic and export markets, but their average technological level will continue to lag that of the developed world.

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Imported technologies have contributed greatly to China's ability to produce commodities it once had to import. We believe that China has most effectively used those technologies imported for the petroleum refining and extraction, aluminum, chemical fertilizer, and shipbuilding industries—basic industries in which it has considerable experience. China has not, however, had great success in duplicating or improving foreign technologies in the ferrous metals, electronics, and aircraft industries. China's ability to absorb technologies has been circumscribed by:

- A limited body of skilled technical personnel.
- The lack of incentives for plant officials or planners to seek advanced, efficient production methods or equipment.
- The diversity of political and geographic jurisdictions involved in technology acquisitions that contributes to poor planning and problems in identifying priorities.
- The concentration of available material and human resources on military programs.

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Over the past five years, China's leadership has tried to define the economy's future technical needs better and to focus both national and international resources on them. Beijing is testing new training programs and industrial management and financial reforms designed to encourage qualitative and technological progress. Such reforms, however, have been very narrowly applied and are meeting stiff resistance from entrenched managers and workers. We believe a shortage of skilled personnel will remain a constraint for many years.

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Beijing has been disappointed with the level of Western participation and is trying to make China more attractive to Western investors. The huge whole plant deals of the past are giving way to joint ventures, licensing, purchases of used factories, and other arrangements that are less costly and more applicable to China's existing industry:

- We expect the Chinese to seek more planning, design, and other conceptual aid, especially from those US firms that supplied the technologies or designs for previous development projects.
- Japan will probably be most involved in China's efforts to upgrade existing plants and in large infrastructural projects for which China wants extensive low-interest financing.
- Beijing has also discussed a few upgrading projects with the Soviet Union and with East European countries. China prefers the more advanced technologies available from Western firms, however, and will probably agree to only limited Bloc participation.

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China: Limitations on Technology Absorption

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Faced with a weak, war-ravaged industrial base, China in the 1950s acquired industrial facilities from the Soviet Union that were the mainspring of industrial development for two decades. Since the early 1970s China has added more than $13 billion in foreign whole plants and major equipment in an attempt to modernize this aging industrial base (see table 1). Additional investments in designs, blueprints, technical specifications, and training total perhaps $2 billion.

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China, however, has lacked the institutional structures, manufacturing capabilities, and skilled personnel to take full advantage of imported technologies. When unable to duplicate or integrate imported technologies into its older industrial facilities, China has had to reenter world markets to acquire additional or upgraded capabilities.

The aim of this paper is threefold:

- To assess China's past effectiveness in using and absorbing industrial technologies.
- To review recent policy changes and proposals designed to enhance China's ability to use and absorb technologies.
- To assess the role foreign firms are likely to play in improving technology absorption capabilities.

The analysis in this paper is restricted to imported industrial plants and equipment, whose progress is more readily monitored in the Chinese press and in reports by foreign industrialists involved in the projects. We also distinguish "utilization"—the ability to put acquired technologies into operation—and "absorption"—the technical ability to understand and integrate acquired technologies into the economy.

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Technology Acquisitions—The Background

Many Western nations maintained trade embargoes against China in the 1950s. For economic and political reasons China turned to the Soviet Union for development assistance. The Soviets provided 156 projects, mostly in such primary industries as petroleum refining, iron and steel, machinery, and chemicals. When Moscow withdrew its support in 1960,

Table 1
China: Whole Plant and Major Equipment Imports

Billion US $

	Value
Total	**13.5**
1963-66	0.2
1967-71	NEGL
1972-76	2.7
1977-79	8.1
1980-83	2.5

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China had sufficient technical capability to complete the unfinished projects, albeit far behind original schedules.

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In the early 1960s China turned to Western Europe and Japan for new plants and equipment. In 1966 the Cultural Revolution undercut both the newly established economic ties with the West and the application of scientific, technical, and educational skills that reflected advanced "Western" methods and attitudes. Those educated Chinese who could have contributed to their nation's growth and development were harassed, the educational system was decimated, and a whole generation of potential scientists and technicians was lost.

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In the early 1970s Beijing briefly resumed purchasing plants and equipment and then undertook a massive acquisition program in 1977. At the same time, many Chinese policymakers began to question whether China had taken on too much and whether it was giving too much emphasis to heavy industry. Since 1979 China has signed for only $2.5 billion in whole plants and major equipment and has redirected its efforts

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Highlights of China's Industrial Technology Import Experiences

Petroleum. *Until the late 1970s China relied on early 1950s technology to find and produce oil. This technology was adequate to exploit some fields, but not for complex or deep deposits. Some Western equipment was imported but not used effectively. In 1978 Beijing realized the drought in new oilfield discoveries thwarted ambitious goals for oil production and exports. The State Council opened the industry to Western equipment and technology, even allowing foreign firms to take over much of the offshore exploration program. Joint ventures to produce drill bits and offshore rigs—initially from imported parts and eventually from entirely domestic sources—are progressing well.*

Refining. *The standard processing units at China's oil refineries are either 1950s Soviet equipment or copies of Western units the Chinese studied in Cuba in the early 1960s. The Chinese have modified both the Soviet and the Western crude oil distillation units to increase capacity. Throughput of the 1950s Soviet-style units was increased from the original design of 20,000 barrels per day (b/d) to 40,000 to 50,000 b/d, and of the Western designs from 34,000 b/d to 50,000 b/d. The Chinese also use a copy of a Western 12,000 b/d catalytic cracker to convert heavy oils into gasoline, gases, and light diesel fuels. The Chinese continue to build this unit in their refineries, but we have seen no modifications to it.*

Chemicals. *Chemicals accounted for nearly half the value of whole plant contracts in 1963-79. China has reproduced intermediate-level synthetic fiber technologies in every province, but, even after building copies of more sophisticated petrochemical and fertilizer plants, continued to import those plants, probably because it is still easier and cheaper to buy certain equipment and controls. Imported chemical plants are plagued by unskilled operators, interruptions in power and raw material supplies, and substandard product quality, but on average operate at 60 to 80 percent of design capacity (some have temporarily exceeded design capacity). Most plants imported in the 1970s were parts of huge complexes that severely taxed the human, technical, and material resources available; China is now turning to smaller projects to upgrade plants and develop consumer chemicals for export.* 25X1

Metals. *Large-scale projects also characterize technology acquisitions in China's metallurgical industry. The two major iron and steel projects, at Wuhan and Baoshan, were poorly planned, and construction shortcuts at Wuhan nearly buried the whole project.* 25X1 *A more recent project in the aluminum industry has progressed smoothly, probably because China has extensive experience building aluminum plants. Beijing is concentrating now on upgrading plants such as An-shan, their largest iron and steel plant, and on improving ability to produce alloys and metal products needed for modern industrial development.* 25X1

Machine Tools. *Although Beijing wants to build sophisticated tools for international markets, most of China's machine tool exports are still relatively simple, general purpose machines destined for less developed countries. China has copied Western machine tools for 25 years with limited success and since 1979 has obtained foreign help to upgrade the industry, largely through licensing and joint ventures. A major impediment to meeting international machine tool levels is China's inability to produce mechanical and electronic controls.* 25X1 25X1 25X1

Electronics. *China started in the late 1960s to use foreign technology and equipment to expand its electronics industry with particular emphasis on components. Substandard facilities and raw materials, as well as other problems, have kept capacity utilization of factories producing high-grade components at 30 to 40 percent. Chinese-developed computers, based on*

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US systems, are used in industry, but utility is limited because designs were altered and they are not compatible with foreign peripherals and software. Imported consumer electronics plants (televisions) are now in operation and forcing domestic factories to seek upgrading help to compete in terms of product mix and quality. Beijing is restructuring the electronics industry and itemizing priorities, importing design and manufacturing technologies, and making assembly arrangements to improve the industry's use of foreign technology.

Transportation. *China's air, rail, and road sectors have purchased aircraft, locomotives, vehicles, and some air and rail traffic management systems but have shown little serious interest in Western manufacturing technologies. On the other hand, the maritime sector has thrived on cooperative production arrangements that are bolstering shipbuilding and freight container output for export. Recently, the automotive industry started to obtain foreign assistance to manufacture parts and jeeps. These joint projects in the transportation sector initially rely heavily on foreign materials and equipment, with plans for increasing use of Chinese-produced components.*

Textiles. *China has extensive experience producing textiles from cellulosic fibers (rayon, acetate) and natural fibers, but built its entire chemical fiber (nylon, polyester, acrylic) industry with imported and copied technologies. Inconsistent size and processing characteristics of their chemical fibers have forced the Chinese to use imported fibers to make many export fabrics and to seek help in correcting processing deficiencies. The Ministry of Textile Industry is contracting with foreign firms to advise on methods to improve fabric quality and modernize fabric treatment capabilities (dyeing, preshrinking, water-repellency).*

its efforts toward specific equipment purchases, cooperative projects, and conceptual technologies, largely to support the development of a labor-intensive, export-oriented light industry. Two long-term goals now drive China's foreign technology acquisitions: a desire to become more self-sufficient and eventually reduce capital imports, and more efficient industrial use of energy and raw materials. 25X1

Technology Utilization and Absorption—The Record

We believe China has had remarkable success utilizing imported industrial technologies, given the technical, bureaucratic, and political obstacles it has faced. Our sectoral analysis suggests that the Chinese operate many imported plants and equipment at rates comparable to those in other less developed economies and in some cases at the level of developed nations. For example, imported plants, using oil from fields the Chinese developed, account for 95 percent of China's ethylene capacity and have been instrumental in the rapid increase in the production of synthetic fibers, plastics, and films. Imported plants also account for 80 percent of China's high-grade nitrogen fertilizer and half or more of television production capacity. 25X1 25X1

The key to China's successful exploitation of imports has been a core of technicians and engineers, many of whom were foreign trained. These people have been able to continue expanding China's industries using technologies of the 1940s and 1950s, particularly in the energy, transportation, and machine-building sectors. They were too few to permit the luxury of extensive new product and process research, however, and were therefore unable to make significant improvements on most older technologies. Westerners were impressed, nonetheless, with some Chinese achievements—for instance, the development in the 1960s of the Daqing and Shengli oilfields. 25X1

The core of skilled personnel has diminished over the years because of aging and political harassment and 25X1 25X1

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because of the sparse numbers of scientific and technical workers who graduated during the years 1967-76. China's educational system is now providing a modest number of new engineers and technicians who are generally well grounded in engineering and process theory;[1] however, many Western industrialists have found them unable to apply theory to industrial operations. Beijing now looks to the West not only for technologies, but also for the training and education to support utilization, absorption, and economic development.

Factors Inhibiting Absorption

Although China has been able to use many of its acquired technologies, it has a mixed record in absorbing them. Like other centrally planned economies, China has trouble reconciling its economic planning system and the authority of the central government with the autonomy needed by industries to research and adapt technologies. The diversity of political and geographic jurisdictions involved in the Chinese decisionmaking process encourages inefficient compromises and complicates the arrival at a consensus on economic plans. In turn, the rigidity of the plan—with its tight resource allocations and output demands—stifles the flexibility and spontaneity that spur innovation in market economies. China's recurrent anti-Western campaigns also inhibit factory managers and engineers from forming the close relationships with foreign firms and counterparts that could help improve absorptive capabilities. As a result of these systemic problems, a number of factors limit China's ability to absorb foreign technologies.

Poor Systems Planning. The Chinese have not always planned new projects well, in the main because they have been slow to adopt the extensive preplanning required for construction of modern industrial plants. They often have installed expensive foreign equipment only to find that raw material or electric power supplies are inadequate. The Wuhan steel mill, for example, was built with inadequate power supplies, and until new power sources were arranged, large parts of the city of Wuhan were blacked out whenever the steel mill operated.

[1] Of nearly 140,000 graduates of institutions of higher learning in 1981, only about 22,000—16 percent—studied engineering, agriculture, or science.

The Chinese have also tended to overestimate their abilities to finance, install, supply, and operate advanced plants and equipment. In 1978 after purchasing several very small (by international standards) plants to produce polyester and its component chemicals, Beijing ordered equipment for what was to be the world's largest polyester complex. Once the extent of costs and feedstock requirements became clear, the scale of this project was reduced and much of the equipment stored until 1983. Where an intermediate-size plant would have been adequate, manageable, and probably operating by now, overconfidence resulted in a costly and, so far, unproductive exercise.

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Lack of Priorities. Each time China has entered world markets for civilian industrial plant and equipment it has initially focused on one or two sectors but then negotiated for a full spectrum of technologies. This inability or unwillingness to concentrate resources on a carefully developed priority basis has led to increased competition for construction and other industrial materials, wasteful duplication of facilities, and dispersal of the relatively few qualified personnel among too many projects.

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Bureaucratic Squabbling. Many Chinese agencies are involved in the acquisition of foreign technologies, each with its own interests. Bureaucratic infighting over the types and sources of foreign technologies frequently has led to high-level arbitration. In rare cases, such conflict has contributed to industrial progress: the Ministry of Metallurgy was once forced to buy $1 million in testing equipment to improve the quality of its oilfield drill pipe because the Ministry of Petroleum preferred to buy Japanese and US pipe. In general, however, the friction has caused only political tension and delays.

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Rivalry among firms and between provinces or cities has also inhibited absorption by undermining needed intraindustrial cooperation. In mid-1982, an article in *Hongqi (Red Flag)* described "regional economic blockades" in which localities, choosing to manufacture products themselves, refused to ship materials

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elsewhere for processing or to share new methods or technologies. Plants with advanced methods or equipment, regardless of source, also are not always willing to share their knowledge with other plants for fear of losing their competitive edge. Recent Chinese emigres report that the practice continues.

Inappropriate Technologies. China's technology acquisitions through the 1970s concentrated on primarily capital- and energy-intensive heavy industrial processes that proved difficult to absorb because of their large scale and complexity. These provided China an extensive base for developing downstream consumer and light industries—for example, plastic products from petrochemical plant output. But we believe China might have more effectively used its resources to acquire less sophisticated technologies and to concentrate on developing machining, assembly, and consumer goods production that get the most out of China's largest resource—labor.

Furthermore, by buying foreign-made capital goods, China neglected its own machine-building industry, which has continued to churn out unwanted mediocre machinery and, thus, has developed huge inventories. Industrial planners could have incorporated domestically made machinery, but they turned instead to Western manufacturers because of higher quality and quicker delivery. some domestic manufacturers, seeking opportunities to upgrade Chinese industry, have tried to stop customers who wished to turn first to Western suppliers. For instance, in 1982 officials at Daqing oilfield wanted to import US submersible pumps, citing an urgent need. A Ministry of Machine Building factory fought the purchase, however, so that it could import parts for assembly in China and thus learn the technology. Months passed before a compromise permitted the oilfield to import some complete pumps and the factory to assemble others.

Incentives. Chinese industry has had little incentive to manufacture quality goods, cut costs, or innovate. Enterprises have not been judged on their production costs—which are understated because raw materials are priced below their true value—or on the quality and marketability of their products, but on the gross value of their output. As a result, factory managers and planners have been reluctant to risk investing in new technologies that are more efficient but that might reduce their gross output value. 25X1

Concentration of R&D on the Military. China can marshal its technical, financial, and human resources to achieve high-priority military objectives. The decade-and-longer development programs for ICBMs and the Han- and Xia-class nuclear submarines are examples. 25X1 25X1 This program did not succeed, primarily because of the lack of a suitable airframe. The priority given these military programs has limited the resources available for research and development of civilian industry. China has thus had few resources to concentrate on selected civilian programs, such as the development of the Daqing oilfield in the 1960s and the expansion of the chemical fertilizer industry in the early 1960s and again in the 1970s. 25X1

Policy Changes Affecting Technology Absorption 25X1

Since the late 1970s China has been reevaluating its economic status and development goals. Policy debates continue, especially over the level of foreign participation and the degree to which market forces should influence the economy. Yet several basic objectives are clear: reduce and redirect investment; upgrade the technological level of existing plants; 25X1 increase exports; and improve efficiency, product mix, and quality. Extensive discussions in the Chinese press suggest that Beijing expects changes in factory management, training, and planning to have major beneficial effects on China's absorptive capacity.

Redefining Requirements. Part of the reevaluation 25X1 has been an intensive review of past technology acquisitions to define future needs better. China's official press and importing agencies have made clear a desire to increase output of consumer goods and 25X1 improve product quality. Problems in energy conservation and air and water pollution have underlined the need to seek technologies that improve the operations of existing plants. The central government's emphasis on these aspects of technology transfers is intended to force technology recipients to use acquisitions more effectively. 25X1

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Technology importers also express to Western suppliers a greater awareness now of the need for extensive feasibility studies. Instead of expecting suppliers to do advance work automatically (whether or not contractually required), the Chinese are doing more themselves or hiring foreign engineering firms. When outside consultants do feasibility studies, Chinese engineers participate to study their techniques.

Focusing Resources. China has issued numerous guidelines designed to concentrate financial, material, and human resources on priority projects; principal goals include increased exports and, in the long run, an enhanced ability to produce a greater diversity of goods. The State Council has directed a reduction in capital investment and a shift of remaining investment funds to priority projects. A special working group of the State Economic Commission (SEC) has selected and set priorities for categories of projects designed to upgrade existing factories that will require the acquisition of some 3,000 items of advanced equipment or technology in 1983-85. According to Zhu Rongji, a vice minister of the SEC, 80 percent of China's growth in output value over the past 30 years or so has been from new plants, while only 20 percent has been through improving the efficiency of existing plants, nearly the reverse of industrial nations. The SEC hopes to narrow that difference.

China also has extended authority to selected cities and provinces to import foreign technologies to upgrade factories. So-called central cities—such as Shanghai, Tianjin, and Chongqing—have been encouraged by State Council directives to organize projects that cross ministerial and provincial lines and require outside expertise. In addition, central authorities encourage and provide some funding for interregional economic cooperation. Last year the State Planning and Economic Commissions and the Commission of Science, Technology, and Industry for National Defense publicly announced the beginning of formal planning for closer cooperation between defense and civilian industries. Defense has been a primary recipient of research and development resources and imported technologies and, if this program is fully implemented, the prospects for a better diffusion of technology from military to civilian enterprises will improve.

These measures are long-term approaches to development and are being resisted by entrenched managers and workers—press sources make it clear that Beijing already has had trouble getting localities and factories to reduce unauthorized investment—and are subject to changing priorities. Upgrading may run into other even more practical problems; some foreign industrialists who have seen the plants China wants to modernize describe them as beyond repair.

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Reforming Industrial Management. China is trying to streamline its industrial bureaucracy and reform management practices to increase efficiency and advance technologically. Corporations have been formed to better link research, development, and production functions in priority sectors such as energy, transportation, electronics, and petrochemicals. Enterprise consolidation and specialization programs are the focus of industrial reorganization plans. Inefficient factories are being closed or switched to different product lines. Plants that once were vertically organized and aimed at total self-sufficiency are now specializing; groups of interdependent plants, each responsible for certain components or subassemblies, are affiliating for the manufacture of final goods.

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Identification and closure of plants will be easier for the government when responsibility systems are installed at more enterprises. Traditional plant management—more often than not a party committee—assured that the production plan was met, but with little or no concern for process efficiency or product quality; state subsidies covered losses and provided no incentive to cut costs or improve output. Responsibility systems give plant managers greater fiscal accountability and personnel control; plants can retain a portion of their revenues for reinvestment; innovation is to be rewarded; and, after an initial adjustment period, deficits will not be covered by the State.

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These various reforms have been introduced in only a small number of enterprises, and some have been misapplied or even rejected by plant managers. Resistance has been high because many of the prospective changes threaten the current benefits and

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status of both bureaucrats and plant managers, as well as pressure them to perform at levels that may be beyond their capabilities.

Attracting Western Participation. Since the flurry of plant and equipment purchases in 1977-79, the Chinese have attempted to obtain more conceptual technologies that are less costly and more applicable to existing production hardware. A primary vehicle for this has been more active cooperation and direct participation by Western firms through licensing, consultancies, technical service contracts, and joint production. According to a 1982 *China Daily* article, these four methods accounted for nearly 30 percent of the value of technology contracts in 1981, up from less than 1 percent in 1978.

Beijing has also tried to modify its legal system to help protect foreign firms and technologies. The Chinese, disappointed by the low level of foreign participation, hope that more comprehensive laws will increase the confidence of Western industrialists in the Chinese business environment. In October 1983, *Xinhua News Agency* announced a forthcoming revision of customs regulations that would afford preferential treatment to imports destined for projects that have foreign participation. To relieve the concern of many Western firms about violations of licenses and proprietary technologies, China joined the International Association for the Protection of Industrial Property in May 1983 and is expected to issue a patent law soon.

Encouraging Exports. Although a principal reason for export promotions is to increase foreign exchange earnings, another benefit is that producers are forced to make technological improvements in product mix and quality to compete successfully in international markets. To support this goal, many of the joint production agreements allow China to receive new production technologies and/or equipment and pay the supplier in product. This program has been successful in a broad range of product lines, from international shipping containers to cosmetics, with few serious quality problems.

Obstacles to Improved Technology Absorption

Beijing's efforts to refashion China's economic system will be slowed by some inevitable constraints. We believe bureaucratic inertia—a preference for the old "comfortable" ways of operating and a desire to protect existing managerial perquisites and jobs—will continue to delay managerial and structural reforms. At least one province (Liaoning) has reacted harshly to failures by factory officials to implement reforms and generate profits, firing those whose plants suffer chronic losses. Most regions, however, appear to be moving more slowly. 25X1

The leadership is encountering trouble controlling resource use. Localities and enterprises persist in building unauthorized projects. Diversion of construction materials to these projects and their subsequent demands for energy and raw materials promise to impede Beijing's plans further. In addition, the unauthorized projects often do not mesh with the advancement objectives and tend to prolong the use of the outmoded technologies Beijing is trying to replace. 25X1

Specialization and interdependence is also taking place primarily in areas where transport requirements already strain available capacity. We believe that transport systems will have difficulty moving additional components from manufacturing sites to distant assembly plants. Unless the transportation system can reliably deliver the parts and components for interdependent industries, the specialization effort will falter and slow the drive for efficiency and modernization. 25X1 25X1

Development of skilled personnel may well be the biggest stumblingblock. China has a huge bureaucracy and some 350,000 industrial enterprises that need managers, technicians, and engineers. Yet of the more than 10,000 students and advanced scholars in the United States, fewer than 15 percent are studying

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Table 2
China: Student Specializations

Percent

Discipline	Share of Total
Physics	17.9
Chemistry	11.5
Medical/health	10.4
Engineering (unspecified)	8.5
Electrical/electronic/communications	8.3
Mathematics	7.7
Computer science	7.5
Biology	5.9
Social science	4.3
Mechanical engineering	3.0
Nuclear	2.9
Agriculture	2.5
Materials/metallurgy	2.4
Space/astronautics	1.9
Geology/geography/oceanography	1.5
Management	Less than 1
Civil engineering	Less than 1
Aeronautical engineering	Less than 1
Industrial engineering	Less than 1
Hydrodynamics	Less than 1
Lasers/optics	Less than 1
Architectural engineering	Less than 1

subjects with direct application to industry—engineering, management—while a disproportionate 60 percent are in scientific and research fields (see table 2), which have indirect or long-term impact on industry. The few engineers and managers trained in the United States and elsewhere are augmented by those Chinese who receive practical training on site at Western firms. The effectiveness of these trainees continues to be slowed by rudimentary foreign language skills. Beijing also plans to establish eight new management training centers patterned after the successful joint PRC-US school in Dalian. Agreement has already been reached with the Japanese to establish one of these centers, and the others are under discussion with Canada, West Germany, France, Australia, Hong Kong, and the European Community.

Reluctance of foreign investors will further impede progress. Costly negotiating delays, aggressive Chinese acquisition of as much free advice and technology as possible, and Beijing's play of vendors against one another continue to disillusion many firms. Investors also are likely to remain wary of projects until they are assured that China's forthcoming patent law will protect patented processes and equipment. Further, firms continue to refuse to sell China technology because they fear China will use their plants and technologies to produce export goods in direct competition with them.

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International Implications

We have already seen that China is buying fewer of the large-scale expensive factories and complexes that attracted international firms in the 1970s. Many of the factories Beijing is now importing are used plants idled by the recession of 1980-82. China has acquired textile and machinery plants from the United States and chemical plants from Europe in this way. Additional such purchases are likely

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China is seeking designs and other conceptual technologies rather than hardware, and this may benefit US firms. Although Japan was the dominant contractor for those plants bought in the past, US designs and technologies were the basis of many. We believe the Chinese will return directly to those US firms for help and consultation as they try to design their own equipment and processes.

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Japan will probably be the most involved in advising on plant upgrading, partly because the Japanese effort is coordinated through the Ministry of International Trade and Industry (MITI) and Japanese financing is available at interest rates acceptable to the Chinese. The Soviet Union wants to help upgrade some of the plants it supplied in the 1950s, and several East European countries also are studying projects slated for modernization. Soviet and East European technologies are not as advanced as those in Japan, the United States, and Western Europe, but Beijing has recently agreed to allow the USSR to upgrade at least two, and possibly four, factories.

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Prospects for Change

Beijing recognizes that past periods of isolationism resulted in technological stagnation. But China's leaders also are persuaded that many less developed countries involved with multinational corporations have relinquished too much of their decisionmaking authority to the foreign firms. In the Chinese view, these firms keep host-country workers in labor roles and do not share technological expertise or financial benefits. We believe the present economic leadership in Beijing expects—by modifying China's economic management and educational systems and through temporary alliances with Western firms—to develop an absorptive capacity that will eventually permit greater self-generated technological progress. 25X1

We believe that China's active participation with Western firms in establishing modern industries will eventually contribute to the development of an absorptive capability superior to that of those less developed countries that have relied on Western firms to build and operate modern plants within their borders. We also believe that China's ambitions for technological progress and increased self-sufficiency over the next 20 years are unrealistic. Beijing's concentration of domestic and foreign resources on particular sectors and its attempts to reform industry and management should foster more effective use of technologies. We believe, however, the process will be slower and more complicated than Beijing's official pronouncements suggest. 25X1

We expect Beijing to become increasingly and unalterably linked with other nations in trade relationships, yet Beijing will remain extremely sensitive about the extent to which contacts with Westerners may influence Chinese society and culture. Movements such as Beijing's current "cultural contamination" campaign are intended to limit unwanted social and political influences but have a potential to disrupt beneficial economic and technical contacts. Barring unanticipated disruptions in these international economic ties, Chinese industries will advance into more contemporary processes and products previously available only through imports. Their average technological level will continue to lag the West; the gap will narrow but will still exist. 25X1

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